AMENDMENTS TO THE SPECIFICATION

1. Please replace paragraph [0025] with the following replacement paragraph:

[0025] FIG. 7 illustrates the second step of the data-aided timing synchronization of ~~FIG. 7~~ FIG. 6.

2. Please replace paragraph [0026] with the following replacement paragraph:

[0026] FIG. 8 illustrates the third step of the data-aided timing synchronization of ~~FIG. 7~~ FIG. 6.

3. Please replace paragraph [0049] with the following replacement paragraph:

[0049] In some embodiments, the size of the increment is adjusted to achieve coarse timing synchronization, also referred to as acquisition, by incrementing at the frame level to achieve an integer multiple of the symbol duration, i.e. n_ε, with ambiguity less than one frame duration. In other embodiments, the size of the increment is adjusted to achieve fine timing synchronization, also referred to as tracking, by incrementing at the chip level to achieve an integer multiple of the frame duration. In further embodiments, the size of the increment is a non-integer value and timing synchronization unit ~~16~~ 14 is implemented with voltage controlled clock (VCC) circuitry.

$s(N+m+n_0)$	+1	+1	-1	-1
$s(N+m+n_0+1)$	+1	-1	-1	+1
$s(N+m+n_0+2)$	-1	-1	+1	+1
A	+E	- E	+ E	- E
B	- E	+ E	- E	+ E

Table 1

4. Please replace paragraph [0066] with the following replacement paragraph:

[0066] FIG. 3 is a block diagram illustrating an example embodiment of timing synchronization unit 14 of receiver 8 (FIG. 2). For purposes of illustration, timing synchronization unit 14 employs data-aided timing synchronization. Clock 22 receives waveform 15 and initiates data-aided timing synchronization when a change in amplitude of received waveforms 15 is detected. Clock 22 ~~multiples~~ multiplies the received waveform by delay T_s 23 and correlator 24 correlates M/2 successive symbol duration waveform pairs[[.]] via equations (30) starting at time t_3. Clock 22 ~~multiples~~ multiplies t_3 by a selectable value, such as a frame duration, i.e., $t_3' = t_3 + T_f$, until t_3

is incremented by a symbol duration $t_3' = t_3+T_s$. Correlator 24 correlates M/2 successive symbol duration waveform pairs for each incremented time value t_3'. Decision unit 26 receives the output of correlator 24 for each time value and selects the increment value that resulted in the greatest correlation according to equation (30). Equation (24) employs a training sequence such that the greatest correlation occurs when the M/2 pairs of waveforms are each of opposite polarity. Equation (18) implies that by correcting t_3 with $n_\varepsilon T_f$, $(N+1)T_s$ is obtained. Additionally, because $\varepsilon_l \in [0, T_f)$, the acquisition error is bounded by one frame duration. Using similar techniques, fine timing synchronization can be achieved with variable non-integer increments.

5. Please replace paragraph [0068] with the following replacement paragraph:

[0068] FIG. 4 is a timing diagram illustrating exemplary waveform segments of duration T_s for two separate received waveforms ~~34 and 36~~ 32 and 34 which are observed by receiver 8 of communication system 2. For illustrative purposes, supplemental notation for describing timing synchronization with dirty templates is introduced in the following sections. The notation introduced in relation to the following figures should not be taken as contradictory to the previous notation or as limiting the previous notation. Rather, the supplemental notation should be viewed as supporting the following figures and substantially strengthening a conceptual illustration of timing synchronization with dirty templates.

6. Please replace the "ABSTRACT" with the following replacement "ABSTRACT":

ABSTRACT

Techniques are described for synchronizing the timing of the receiver with the received waveform in ultra wideband (UWB) communication systems. ~~Unlike conventional techniques in which a "clean" transmit waveform is correlated with the received waveform to estimate the timing offset, the~~ The described techniques correlate the received waveform with dirty templates, i.e. segments of the received waveform, with the received waveform to estimate the timing offset. The described techniques include receiving an ultra wideband (UWB) waveform through a wireless communication channel, wherein the received UWB waveform comprises bursts of information-bearing symbols. A template is selected to be used for estimating the timing offset of a burst of the received UWB waveform, wherein the template comprises a segment of a burst

of the received UWB waveform, and the template is correlated with a segment of a burst of the received waveform so as to form an estimate of the timing offset of the received UWB waveform. A stream of symbol estimates is output in accordance with the estimated timing offset.

AMENDMENTS TO THE DRAWINGS

Appended hereto, Applicant submits herewith replacement drawing sheets for FIG. 4, 6-9, and 12-17 of the present application. These amendments to the drawings do not introduce any new matter, and are fully supported by the original disclosure.